## VIRGINIA GIS REFERENCE BOOK

General Application Category/Sub Application Name: Public Works/Service Authority – Facilities Mapping

Product /Service/Function Name: Wetlands Inventory

P/S/F/ Description: An application used by Service Authority/Public Works personnel to locate and/or identify wetlands within the Service Authority or Public Works service area. Wetlands, represented by polygonal areas, can be geographically located by system type, subsystem type, class, or subclass. The Service Authority and Public Works departments are concerned with the impact of their work to the localities wetlands.

The Authority/Public Works Departments typically utilize the spatial and tabular wetlands data provided by The National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service. This includes information on the characteristics, extents and status of the nation's wetlands and deepwater habitats. In most cases, a digital NWI map exists that corresponds to the coverage of a United States Geological Survey (USGS) Ortho Quarter Quadrangle at a scale of 1:12000.

## Product /Service/Function

### 1. Spatial Data

**Spatial Data Definition:** (ESRI, GIS Glossary, 1996) Information about the location and shape of, and relationships among geographic features, usually stored as coordinates and topology. In general terms, spatial data is geographic information.

**Minimum Requirements:** The minimum spatial data required for this basic application includes:

1.) The National Wetlands Inventory maps downloadable from the NWI FTP site, by County. These data are mapped at 1:12000 scale, and can be downloaded in Digital Line Graph (DLG) format. Tools may also be downloaded from this site to convert the DLG files to ArcInfo (Export) file format.

2.) A digital base map, covering the entire facility service area, including identifiable roads, and other basic framework data layers. The basic recommendation for a base map format is vector; however, a raster base map such as a scanned geo-referenced facility map may suffice. High-resolution digital orthophotography, or maps generated from these data will provide the

most accurate base map and include many features visible from the air at a specific altitude.

**Optional Requirements:** Optional spatial data requirements for this basic application include:

1.) The use of a more accurate base map, from a source such as aerial photography, surveys, GPS or digital orthophotos.
2.) Additional facility information, such as planned future construction sites, and other activities within each service area that may impact the local wetlands.

## 2. Attribute Data

**Attribute Data Definition:** (ESRI, GIS Glossary, 1996) 1.) A characteristic of a geographic feature described by numbers, characters, images and CAD drawings, typically stored in a tabular format and linked to the feature by a user-assigned identifier.

**Minimum Requirements:** The minimum attribute requirements include those delivered with the NWI spatial data. The NWI attribute table includes the following Wetlands or Deepwater Habitats classification structure:

| | |
|---|---|
| System: | Marine, Estuarine, Riverine, Lacustrine, etc. |
| Subsystem: | Subtidal, Lower Perennial, Intermittent, etc. |
| Class: | Streambed, Rock Bottom, Emergent, Reef, etc. |
| Subclass: | Organic, Algal, Bedrock, Rubble, sand, etc. |

This classification system includes a specific nomenclature for each wetland polygon. For example, the code, E2RF, refers to the following wetland area: Estuarine, Intertidal, Reef.

**Optional Requirements:**
None

## 3. Data Acquisition Options (integrated with VBMP digital orthos)

The integration of these data with the VMBP digital orthophotographs will provide a highly accurate base map for better wetland identification and environmental analysis

The NWI spatial data may not be at the same scale or projection as the Public Works/Authority's base map and may require adjustment. This may entail adjusting, or conflating the existing wetland spatial data to the new VBMP orthophotos.

## 4. Data Conflation Options (integrated with VBMP digital orthos)

Conflation is the method whereby a geographic feature is adjusted to fit a more accurate base map. This process can occur in variety of ways, with the least sophisticated being a "best-fit" methodology. The best-fit method is a visual

inspection or comparison of a geographic feature's current position to where it is or should be located on the more accurate base map.

Another conflation option includes rubber sheeting, a method using control points or existing boundaries to establish the new geographic position of a feature. Finally, the most accurate method of conflating data includes the use of Global Positioning Satellite technology (GPS), or traditional survey instruments to accurately locate each desired object's physical location.

## 5. GUI / Programming Options

**Graphical User Interface Definition:** (ESRI, GIS Glossary, 1996) A graphical method of controlling how a user interacts with a computer to perform various tasks. Instead of issuing commands at a prompt, the user performs desired tasks by using a mouse to choose from `a dashboard' of options presented on the display screen. These are in the form of pictorial buttons (icons) and lists. Some GUI tools are dynamic and the user must manipulate a graphical object on the screen to invoke a function; for example, moving a slider bar to set a parameter value (e.g., setting the scale of a map).

GIS software can be modified utilizing a variety of programming languages or scripting languages and may vary depending upon the system architecture. Languages such as Microsoft Visual Basic are commonly used to invoke macros and customized functions such as GIS queries. Commonly used languages include: Visual Basic, C++, Java, HTML, ASP, ColdFusion, JSP, PERL, PHP and CGI.

## 6. Internet Functionality and Options

Internet functionality should include basic GIS functions available in a thin client GIS application, such as ESRI's ArcExplorer (i.e. Zoom In, Zoom Out, Pan, Identify, Query, Thematic Mapping … etc.). Additional functionality may include appropriate hyperlinks to critical and related information on the Internet related to certain queries or operations within the application. A dedicated "needs based" approach to determine user interface options and functionality is highly recommended before actual application work is to begin.

An Internet application allows the organization to share its spatial and tabular information to all authorized users via a familiar Internet Browser interface. This eliminates multiple software license fees. Additionally, the Map Server (Web Server) is the only GIS hardware/software component that would be managed by the localities Information Technology Department.

**7. Minimum Technical Requirements**

A Basic working knowledge of a leading GIS software, and Internet Browser are required. A Pentium III or greater CPU, with a minimum of 128MB Ram, 16MB Video Card, is required. A higher speed Internet connection is recommended for GIS Internet application deployment and analysis. Most leading GIS software is customizable using MS Visual Basic or other common language. It is suggested that the developer have a working knowledge of (at least) Visual Basic before attempting GUI development.

**Optimum Technical Requirements:**

In the case where a local government employs a highly capable Information Technology Department, other languages may be considered, such as JSP, Java, Visual Basic, ASP, and Cold Fusion. In most cases, these languages are related to Internet application development. A web developer with three years of experience should be able to customize and/or develop a unique Internet Map Server application.

**8. Administrative / Management Requirements**

Management concerns will involve technical support, system maintenance and, of course, human resource management issues of a technical product. These issues are minimized if the maintenance and/or hosting of the application are contracted to a GIS application development and hosting organization. Technical and administrative issues become more critical and consuming when developing and/or hosting an application in-house. General expertise in GIS is suggested if outsourcing application development and hosting. In-house application development and hosting will require GIS specialist human resources, advanced web programming human resources, and significant technical material resources (hardware/software).

**9. Cost – Cost/Benefit**

The cost of developing a wetlands inventory application (in house) is typically under $4,500. 30% of this cost is attributed to the acquisition and conflation of each wetland polygon. Programming the application, which includes posting custom queries, accounts for the remaining 70%.

This cost/benefit is highly favorable. Essentially all the data is freely obtained from the US Fish and Wildlife Service. The benefit to the Public Works/Service Authority is intangible. Utilizing this system, the Facility Manager, or Engineer can make better decisions related to the environmental impact of its daily work.

**10. Standards / Guidelines Summary**

The wetland inventory spatial/tabular databases, and any ancillary (such as planned construction) databases, should reflect changes or modifications as soon as realistically possible. The status of NWI map generation and updates is available on the NWI web site.

**11. Startup Procedures/Steps**

**Application Outline / Blueprint:** Application purpose, interface design, functionality, queries and "look and feel" should be determined and documented as an initial step. Stakeholders should be involved in this step.

**Data Acquisition:** The attribute data should be obtained from the NWI of the U.S. Fish and Wildlife Service and normalized. Spatial base map and facility data can be obtained internally, from the Authority/Public Works department.

**Sourcing Determination:** Determine entity/entities that will be performing data development functions, application development functions and application hosting functions.

**12. Estimated Time Line and/or Implementation (stand alone) schedule**

The estimated time to develop this application is minimal. This can be as little as three weeks, to as much as eight weeks. The duration is defined by the size of the service area and how much NWI mapping is adjusted. Typically this type of application can be developed in about 100 man-hours.

**13. Best Practice Examples in Virginia**

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